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UNITED STATES NAVAL OBSERVATORY

C I R C U L A R N O . 1 1 6

U. S. Naval Observatory, Washington, D. C. 20390

September 29, 1967

Total Solar Eclipse of 22 September 1968

by

Julena S. Duncombe

REVISED EDITION

This Circular contains revised
data for pages 12 - 15

GENERAL INFORMATION

The path of the total phase of the solar eclipse of 22 September 1968 touches the earth at sunset in the Arctic Ocean near 80° N. Latitude and 110° E. Longitude. Moving in a southwesterly direction, the path crosses Severnaya Zemlya and the Kara Sea. It crosses the coast of R.S.F.S.R. near Kara at $10^{\text{h}} 54^{\text{m}}$ U.T. and continues in a southerly direction through the states of Tyumen, Sverdlovsk, and Kurgan. The path then crosses Kazak in a southeasterly direction and leaves the earth at sunset near Kara Shahr, Sinkiang, China.

The partial phase of the eclipse of greater or less magnitude, decreasing with the distance from the path of the total phase, is visible over the extreme northeastern coast of North America, Greenland, Iceland, the United Kingdom, most of Europe, northeastern Africa, and the western half of Asia.

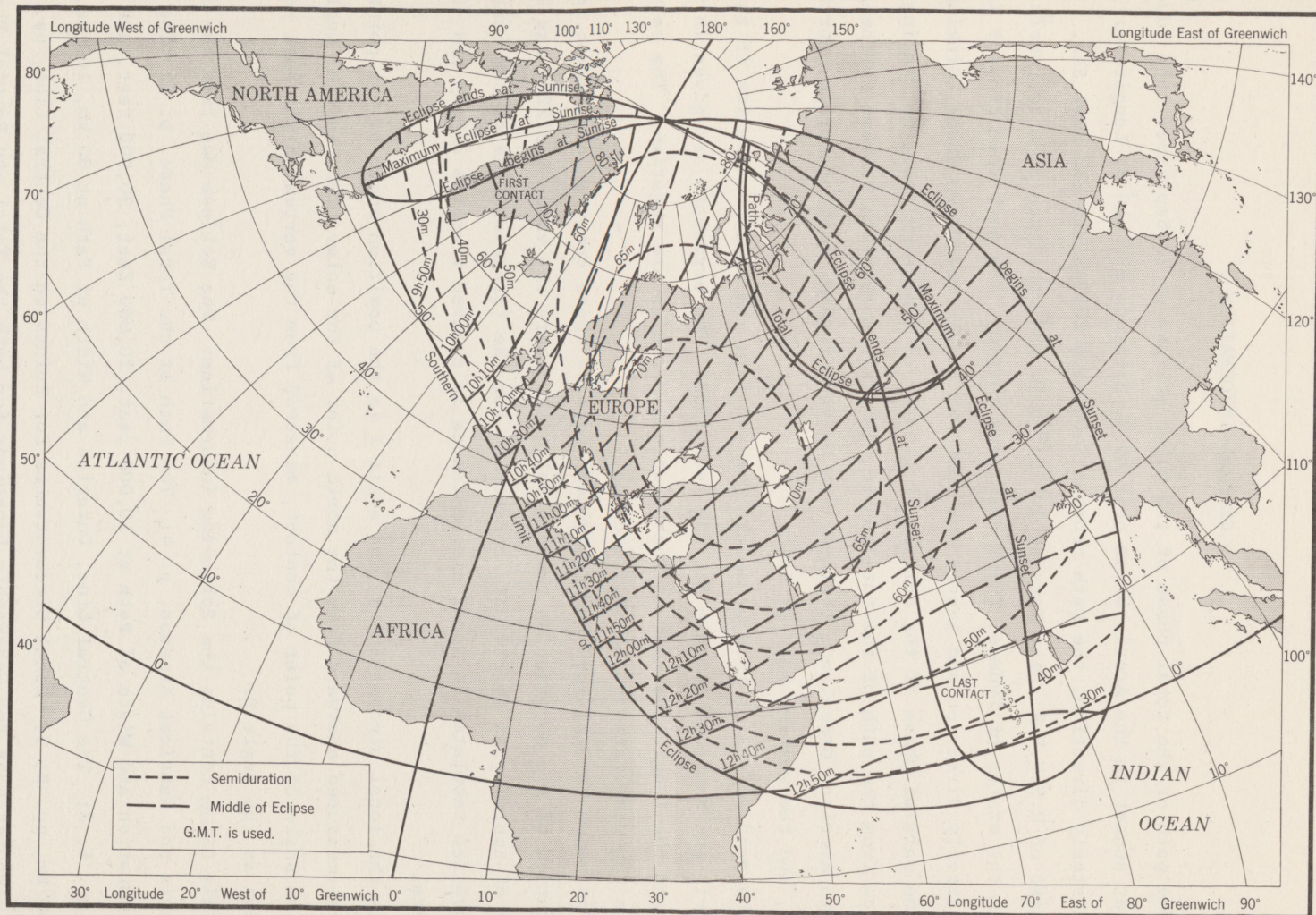
The predictions in this *Circular* are derived from the basic data given in the American Ephemeris and Nautical Almanac for the Year 1968. The arguments are given in Universal Time, and the longitudes east of the Greenwich meridian are negative. The value of ΔT , used in the computations, is 38.5 seconds.

The value of 0.2724880 for k has been used in these computations except for the calculation of the duration on the central line, where the value 0.272281 has been used by way of applying an approximate correction for the irregularities of the lunar limb. The duration tabulated in local circumstances is derived from the second and third contacts.

In the local circumstances, the angle P is the position angle of the point of contact, measured eastward from the north point of the solar limb, and the angle V is the position angle of the point of contact, measured from the vertex in the same sense of rotation as the angle P .

This *Circular* contains the following information: The Eclipse Map from the American Ephemeris and Nautical Almanac, p. 4; The Path of the Total Phase, p. 5; The Central Line, Duration and Width of Path at 10,000 feet, 20,000 feet, 30,000 feet, and 40,000 feet, pp. 6, 7; The Central Line, Duration and Width of Path at 80 km, 100 km, 200 km, and 300 km, pp. 8, 9; Local Circumstances for Points on the Central Line, pp. 10, 11; Local Circumstances for Geographic Locations for both the Total and Partial Phases, pp. 12 through 15.

TOTAL SOLAR ECLIPSE OF 1968 SEPTEMBER 22



726-693 - 0001 M.

PATH OF THE TOTAL PHASE

Universal Time	Northern Limit		Central Line		Southern Limit	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude
	° ' ''	° ' ''	° ' ''	° ' ''	° ' ''	° ' ''
Limit	+79 20	-108 10	+79 34	-108 18	+79 49	-108 26
10 44	.. .. .	... .. .	79 25.9	99 55.1	79 02.3	89 27.4
45	78 32.3	90 43.4	78 09.8	84 47.9	77 45.3	80 00.2
46	77 22.5	82 14.6	76 59.7	78 20.9	76 35.6	74 54.1
10 47	+76 17.4	- 77 21.3	+75 54.8	- 74 20.0	+75 31.4	- 71 34.3
48	75 16.5	74 04.1	74 54.4	71 33.0	74 31.5	69 12.6
49	74 19.2	71 41.5	73 57.5	69 30.4	73 35.2	67 27.3
10 50	+73 24.9	- 69 53.8	+73 03.7	- 67 57.2	+72 41.9	- 66 06.7
52	71 43.8	67 24.4	71 23.3	65 47.0	71 02.4	64 13.5
54	70 10.6	65 48.9	69 50.9	64 23.6	69 30.8	63 01.2
56	68 43.7	64 46.1	68 24.6	63 29.2	68 05.2	62 14.6
58	67 21.9	64 04.8	67 03.4	62 54.0	66 44.6	61 45.1
11 00	+66 04.4	- 63 38.4	+65 46.5	- 62 32.3	+65 28.1	- 61 27.8
02	64 50.6	63 23.1	64 33.1	62 20.7	64 15.3	61 19.6
04	63 39.8	63 16.2	63 22.8	62 16.8	63 05.4	61 18.4
06	62 31.8	63 16.0	62 15.2	62 19.0	61 58.3	61 22.9
08	61 26.3	63 21.2	61 10.0	62 26.2	60 53.5	61 31.9
11 10	+60 22.8	- 63 31.0	+60 07.0	- 62 37.6	+59 50.8	- 61 45.0
12	59 21.3	63 44.8	59 05.8	62 52.7	58 50.1	62 01.3
14	58 21.6	64 02.1	58 06.4	63 11.2	57 51.0	62 20.9
16	57 23.4	64 22.5	57 08.6	63 32.6	56 53.5	62 43.2
18	56 26.7	64 46.1	56 12.2	63 56.9	55 57.4	63 08.3
11 20	+55 31.3	- 65 12.5	+55 17.1	- 64 24.0	+55 02.7	- 63 36.0
22	54 37.1	65 41.8	54 23.2	64 53.8	54 09.1	64 06.4
24	53 44.0	66 14.0	53 30.5	65 26.4	53 16.7	64 39.4
26	52 52.0	66 49.2	52 38.8	66 01.9	52 25.3	65 15.1
28	52 00.9	67 27.6	51 48.1	66 40.5	51 34.9	65 53.8
11 30	+51 10.8	- 68 09.4	+50 58.2	- 67 22.3	+50 45.4	- 66 35.6
32	50 21.4	68 55.0	50 09.3	68 07.7	49 56.8	67 20.9
34	49 32.9	69 44.7	49 21.1	68 57.1	49 08.9	68 10.0
36	48 45.1	70 39.1	48 33.6	69 51.2	48 21.8	69 03.6
38	47 58.0	71 39.2	47 46.9	70 50.5	47 35.4	70 02.3
11 40	+47 11.5	- 72 46.0	+47 00.8	- 71 56.3	+46 49.7	- 71 07.1
42	46 25.5	74 01.2	46 15.3	73 09.9	46 04.6	72 19.3
44	45 40.2	75 27.2	45 30.4	74 33.7	45 20.2	73 41.1
46	44 55.2	77 08.1	44 46.0	76 11.3	44 36.3	75 15.6
48	44 10.7	79 11.7	44 02.1	78 09.3	43 53.0	77 08.6
11 49	+43 48.5	- 80 26.9	+43 40.3	- 79 19.8	+43 31.5	- 78 15.2
50	43 26.4	81 56.6	43 18.5	80 42.3	43 10.2	79 31.8
51	43 04.2	83 51.4	42 56.9	82 23.7	42 49.0	81 03.5
52	42 41.6	86 50.5	42 35.2	84 43.2	42 27.9	83 01.5
53	.. .. .	... .. .	.. .. .	... .. .	42 07.0	86 10.7
Limit	+42 31	- 90 14	+42 16	- 90 07	+42 00	- 89 59

TOTAL SOLAR ECLIPSE OF 22 SEPTEMBER 1968

CENTRAL LINE OF TOTAL ECLIPSE

Universal Time	10,000 Feet		20,000 Feet		30,000 Feet		40,000 Feet	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude
^h ^m	[°] [']	[°] [']	[°] [']	[°] [']	[°] [']	[°] [']	[°] [']	[°] [']
10 44	+79 18.2	- 95 36.0	+79 10.3	- 92 30.5	+79 02.3	- 90 00.6	+78 54.5	- 87 52.7
45	78 02.4	83 20.6	77 55.0	82 00.4	77 47.8	80 46.1	77 40.5	79 36.9
46	76 52.8	77 24.5	76 46.1	76 31.1	76 39.4	75 40.4	76 32.8	74 52.0
10 47	+75 48.5	- 73 38.0	+75 42.3	- 72 57.7	+75 36.1	- 72 19.0	+75 29.9	- 71 41.7
48	74 48.5	70 59.5	74 42.7	70 27.1	74 36.8	69 55.7	74 31.1	69 25.2
49	73 52.0	69 02.4	73 46.5	68 35.2	73 41.0	68 08.7	73 35.6	67 42.9
10 50	+72 58.4	- 67 33.1	+72 53.2	- 67 09.6	+72 48.0	- 66 46.6	+72 42.9	- 66 24.1
52	71 18.6	65 27.9	71 13.9	65 09.3	71 09.2	64 51.0	71 04.5	64 33.0
54	69 46.5	64 07.7	69 42.2	63 52.1	69 37.8	63 36.8	69 33.5	63 21.6
56	68 20.6	63 15.4	68 16.5	63 01.9	68 12.5	62 48.5	68 08.5	62 35.3
58	66 59.6	62 41.7	66 55.8	62 29.7	66 52.1	62 17.7	66 48.3	62 05.9
11 00	+65 42.9	- 62 21.2	+65 39.3	- 62 10.2	+65 35.8	- 61 59.4	+65 32.2	- 61 48.6
02	64 29.7	62 10.5	64 26.3	62 00.3	64 23.0	61 50.3	64 19.6	61 40.3
04	63 19.6	62 07.2	63 16.4	61 57.7	63 13.2	61 48.3	63 10.0	61 39.0
06	62 12.1	62 09.9	62 09.1	62 00.9	62 06.0	61 52.0	62 03.0	61 43.2
08	61 07.1	62 17.5	61 04.2	62 09.0	61 01.3	62 00.5	60 58.4	61 52.1
11 10	+60 04.2	- 62 29.3	+60 01.4	- 62 21.1	+59 58.6	- 62 12.9	+59 55.8	- 62 04.8
12	59 03.1	62 44.7	59 00.5	62 36.7	58 57.8	62 28.8	58 55.1	62 21.0
14	58 03.8	63 03.3	58 01.2	62 55.6	57 58.7	62 47.9	57 56.1	62 40.2
16	57 06.1	63 24.9	57 03.6	63 17.3	57 01.1	63 09.8	56 58.6	63 02.3
18	56 09.8	63 49.4	56 07.4	63 41.9	56 05.0	63 34.5	56 02.6	63 27.1
11 20	+55 14.8	- 64 16.6	+55 12.5	- 64 09.2	+55 10.1	- 64 01.8	+55 07.8	- 63 54.5
22	54 21.0	64 46.4	54 18.7	64 39.1	54 16.5	64 31.8	54 14.3	64 24.5
24	53 28.3	65 19.1	53 26.1	65 11.7	53 24.0	65 04.4	53 21.8	64 57.2
26	52 36.7	65 54.5	52 34.6	65 47.2	52 32.5	65 39.8	52 30.4	65 32.6
28	51 46.0	66 33.0	51 44.0	66 25.6	51 41.9	66 18.2	51 39.9	66 10.9
11 30	+50 56.2	- 67 14.7	+50 54.3	- 67 07.2	+50 52.3	- 66 59.7	+50 50.3	- 66 52.3
32	50 07.3	68 00.0	50 05.4	67 52.3	50 03.5	67 44.7	50 01.5	67 37.2
34	49 19.2	68 49.2	49 17.3	68 41.4	49 15.5	68 33.6	49 13.6	68 25.9
36	48 31.8	69 43.0	48 30.0	69 34.9	48 28.2	69 26.9	48 26.3	69 18.9
38	47 45.1	70 42.0	47 43.3	70 33.6	47 41.6	70 25.2	47 39.8	70 16.9
11 40	+46 59.0	- 71 47.3	+46 57.3	- 71 38.5	+46 55.6	- 71 29.7	+46 53.9	- 71 21.0
42	46 13.6	73 00.4	46 11.9	72 51.0	46 10.3	72 41.7	46 08.6	72 32.4
44	45 28.7	74 23.4	45 27.1	74 13.2	45 25.5	74 03.1	45 23.9	73 53.1
46	44 44.4	75 59.8	44 42.8	75 48.5	44 41.2	75 37.3	44 39.6	75 26.2
48	44 00.5	77 55.9	43 59.0	77 42.7	43 57.4	77 29.8	43 55.9	77 17.1
11 49	+43 38.7	- 79 04.9	+43 37.2	- 78 50.4	+43 35.7	- 78 36.1	+43 34.2	- 78 22.2
50	43 17.1	80 25.2	43 15.6	80 08.6	43 14.1	79 52.5	43 12.6	79 36.8
51	42 55.4	82 02.9	42 54.0	81 43.0	42 52.5	81 23.8	42 51.1	81 05.3
52	42 33.8	84 13.8	42 32.4	83 46.6	42 31.0	83 21.2	42 29.6	82 57.3
53	+42 11.9	- 88 48.2	+42 10.7	- 87 22.4	+42 09.4	- 86 28.4	+42 08.0	- 85 45.5

DURATION OF TOTAL PHASE AND WIDTH OF PATH ON CENTRAL LINE

Universal Time	10,000 Feet		20,000 Feet		30,000 Feet		40,000 Feet	
	Duration	Width of Path	Duration	Width of Path	Duration	Width of Path	Duration	Width of Path
h m	m s	mi	m s	mi	m s	mi	m s	mi
10 44	0 17.4	37	0 18.1	38	0 18.7	38	0 19.2	39
45	0 20.6	41	0 21.0	41	0 21.3	41	0 21.7	42
46	0 22.6	44	0 22.9	44	0 23.2	44	0 23.5	44
10 47	0 24.2	45	0 24.5	45	0 24.7	45	0 25.0	45
48	0 25.6	47	0 25.8	47	0 26.1	47	0 26.3	47
49	0 26.8	48	0 27.0	48	0 27.3	48	0 27.5	48
10 50	0 27.9	49	0 28.1	49	0 28.3	49	0 28.5	49
52	0 29.8	52	0 30.0	52	0 30.2	52	0 30.4	52
54	0 31.5	53	0 31.6	53	0 31.8	53	0 32.0	53
56	0 32.9	55	0 33.0	55	0 33.2	55	0 33.3	55
58	0 34.1	56	0 34.3	56	0 34.4	56	0 34.6	56
11 00	0 35.2	58	0 35.3	58	0 35.5	58	0 35.6	58
02	0 36.1	59	0 36.3	60	0 36.4	60	0 36.5	60
04	0 37.0	61	0 37.1	61	0 37.2	61	0 37.4	60
06	0 37.7	62	0 37.8	62	0 37.9	62	0 38.1	62
08	0 38.3	63	0 38.4	63	0 38.5	64	0 38.7	64
11 10	0 38.8	65	0 38.9	64	0 39.0	64	0 39.2	64
12	0 39.2	66	0 39.3	66	0 39.4	66	0 39.6	66
14	0 39.5	67	0 39.6	67	0 39.7	67	0 39.9	67
16	0 39.7	68	0 39.8	68	0 39.9	67	0 40.1	68
18	0 39.8	69	0 39.9	69	0 40.1	69	0 40.2	69
11 20	0 39.8	70	0 40.0	70	0 40.1	70	0 40.2	70
22	0 39.8	71	0 39.9	71	0 40.0	71	0 40.1	71
24	0 39.6	72	0 39.7	71	0 39.9	71	0 40.0	71
26	0 39.4	72	0 39.5	72	0 39.6	72	0 39.7	72
28	0 39.0	73	0 39.1	73	0 39.3	73	0 39.4	72
11 30	0 38.5	74	0 38.7	73	0 38.8	73	0 38.9	73
32	0 38.0	74	0 38.1	74	0 38.2	73	0 38.4	73
34	0 37.3	74	0 37.4	74	0 37.6	73	0 37.7	73
36	0 36.5	73	0 36.7	73	0 36.8	73	0 36.9	73
38	0 35.6	73	0 35.7	72	0 35.9	72	0 36.0	72
11 40	0 34.5	71	0 34.7	71	0 34.8	71	0 35.0	71
42	0 33.3	70	0 33.4	70	0 33.6	70	0 33.8	70
44	0 31.8	67	0 32.0	67	0 32.2	67	0 32.3	68
46	0 30.1	65	0 30.3	65	0 30.5	65	0 30.7	65
48	0 28.1	61	0 28.3	61	0 28.5	61	0 28.7	61
11 49	0 26.9	59	0 27.1	59	0 27.3	59	0 27.6	59
50	0 25.5	56	0 25.7	56	0 26.0	56	0 26.2	56
51	0 23.8	52	0 24.1	52	0 24.4	53	0 24.7	53
52	0 21.7	48	0 22.1	48	0 22.5	48	0 22.8	49
53	0 17.4	38	0 18.7	40	0 19.5	42	0 20.1	44

CENTRAL LINE OF TOTAL PHASE

Universal Time	80 Km		100 Km		200 Km		300 Km	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude
h m	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "
10 31	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	+84 19.9	- 68 25.0
32	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	82 17.6	57 23.1
33	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	80 40.4	53 09.4
10 34	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	+79 17.3	- 50 57.7
36	.. .. .	.. .. .	.. .. .	.. .. .	+81 17.6	- 67 51.2	76 56.2	48 52.3
38	.. .. .	.. .. .	.. .. .	.. .. .	78 30.4	59 09.5	74 56.3	48 02.2
10 40	+81 22.7	- 98 25.6	+80 21.3	- 79 41.8	+76 15.3	- 55 47.7	+73 09.9	- 47 44.0
42	78 33.6	73 18.1	77 44.7	67 55.5	74 18.7	54 08.6	71 33.4	47 42.1
44	76 16.0	66 21.5	75 34.8	63 10.1	72 34.6	53 16.2	70 04.2	47 49.4
46	74 17.4	62 56.5	73 41.3	60 39.4	70 59.5	52 48.9	68 40.9	48 02.4
48	72 31.5	60 59.2	71 59.1	59 11.3	69 31.4	52 36.7	67 22.4	48 19.1
10 50	+70 55.0	- 59 47.8	+70 25.4	- 58 17.9	+68 08.8	- 52 34.3	+66 08.0	- 48 38.1
52	69 25.6	59 03.5	68 58.2	57 45.7	66 50.9	52 38.5	64 56.9	48 58.9
54	68 01.9	58 36.8	67 36.4	57 27.6	65 36.8	52 47.5	63 48.9	49 21.0
56	66 42.9	58 22.2	66 18.9	57 19.3	64 26.1	53 00.0	62 43.4	49 44.1
58	65 27.9	58 16.2	65 05.2	57 18.3	63 18.2	53 15.3	61 40.2	50 07.9
11 00	+64 16.2	- 58 16.8	+63 54.7	- 57 22.6	+62 12.8	- 53 32.7	+60 39.1	- 50 32.3
02	63 07.4	58 22.5	62 47.0	57 31.3	61 09.7	53 51.9	59 39.8	50 57.4
04	62 01.3	58 32.2	61 41.7	57 43.5	60 08.6	54 12.7	58 42.1	51 22.9
06	60 57.3	58 45.3	60 38.6	57 58.6	59 09.3	54 34.8	57 46.0	51 49.0
08	59 55.5	59 01.3	59 37.5	58 16.2	58 11.6	54 58.2	56 51.3	52 15.7
11 10	+58 55.4	- 59 19.8	+58 38.2	- 58 36.0	+57 15.4	- 55 22.7	+55 57.9	- 52 42.8
12	57 57.0	59 40.6	57 40.4	58 57.8	56 20.6	55 48.3	55 05.6	53 10.5
14	57 00.2	60 03.5	56 44.1	59 21.6	55 27.0	56 15.0	54 14.5	53 38.9
16	56 04.7	60 28.4	55 49.2	59 47.1	54 34.6	56 42.9	53 24.3	54 07.8
18	55 10.4	60 55.3	54 55.5	60 14.5	53 43.3	57 11.8	52 35.1	54 37.5
11 20	+54 17.4	- 61 24.1	+54 02.9	- 60 43.6	+52 53.0	- 57 41.9	+51 46.8	- 55 08.0
22	53 25.5	61 54.9	53 11.4	61 14.5	52 03.6	58 13.3	50 59.3	55 39.3
24	52 34.5	62 27.7	52 20.9	61 47.3	51 15.0	58 45.9	50 12.5	56 11.6
26	51 44.5	63 02.6	51 31.3	62 22.1	50 27.3	59 20.0	49 26.5	56 44.9
28	50 55.4	63 39.8	50 42.6	62 59.0	49 40.4	59 55.6	48 41.2	57 19.3
11 30	+50 07.1	- 64 19.4	+49 54.6	- 63 38.2	+48 54.2	- 60 32.9	+47 56.6	- 57 55.0
32	49 19.6	65 01.7	49 07.4	64 19.9	48 08.6	61 12.0	47 12.5	58 32.0
34	48 32.8	65 47.0	48 21.0	65 04.3	47 23.7	61 53.1	46 29.1	59 10.6
36	47 46.6	66 35.6	47 35.2	65 51.8	46 39.4	62 36.4	45 46.2	59 50.9
38	47 01.2	67 27.9	46 50.0	66 42.9	45 55.7	63 22.3	45 03.8	60 33.1
11 40	+46 16.3	- 68 24.7	+46 05.4	- 67 38.0	+45 12.5	- 64 11.1	+44 21.9	- 61 17.5
42	45 32.0	69 26.7	45 21.4	68 37.9	44 29.9	65 03.2	43 40.5	62 04.4
44	44 48.3	70 34.9	44 37.9	69 43.4	43 47.7	65 59.0	42 59.5	62 54.0
46	44 05.0	71 50.9	43 55.0	70 56.0	43 06.0	66 59.4	42 19.0	63 46.8
48	43 22.2	73 17.0	43 12.5	72 17.4	42 24.7	68 05.2	41 38.8	64 43.4
11 50	+42 39.9	- 74 56.9	+42 30.4	- 73 50.6	+41 43.9	- 69 17.5	+40 59.1	- 65 44.4
52	41 57.9	76 57.2	41 48.7	75 40.5	41 03.4	70 38.2	40 19.7	66 50.8
54	41 16.3	79 32.7	41 07.4	77 57.0	40 23.3	72 09.9	39 40.7	68 03.6
56	+40 34.8	- 83 36.4	+40 26.3	- 81 06.3	39 43.5	73 56.9	39 02.0	69 24.6
58	.. .. .	.. .. .	.. .. .	.. .. .	39 04.0	76 07.6	38 23.6	70 56.5
12 00	.. .. .	.. .. .	.. .. .	.. .. .	+38 24.7	- 79 02.1	+37 45.4	- 72 43.4
01	.. .. .	.. .. .	.. .. .	.. .. .	38 05.1	81 04.9	37 26.5	73 44.7
02	.. .. .	.. .. .	.. .. .	.. .. .	+37 45.3	- 84 25.8	37 07.5	74 53.3
03	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	36 48.7	76 12.0
12 04	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	+36 29.8	- 77 45.5
05	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	36 10.9	79 44.8
06	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	.. .. .	+35 51.9	- 82 50.5

9

Universal Time h m	80 Km		100 Km		200 Km		300 Km	
	Duration m s	Width of Path mi	Duration m s	Width of Path mi	Duration m s	Width of Path mi	Duration m s	Width of Path mi
10 31		...		...		...	0 19.3	30
32		...		...		...	0 22.4	33
33		...		...		...	0 24.6	35
10 34		...		...		...	0 26.5	37
36		...		...	0 21.8	35	0 29.6	39
38		...		...	0 25.8	38	0 32.1	41
10 40	0 16.5	33	0 20.4	36	0 28.7	42	0 34.3	43
42	0 22.7	40	0 24.5	41	0 31.2	43	0 36.3	45
44	0 26.0	43	0 27.4	43	0 33.2	46	0 38.0	46
46	0 28.5	46	0 29.8	46	0 35.1	47	0 39.6	47
48	0 30.6	48	0 31.7	48	0 36.7	48	0 41.1	49
10 50	0 32.4	50	0 33.4	50	0 38.2	50	0 42.4	50
52	0 34.0	51	0 35.0	52	0 39.5	52	0 43.6	51
54	0 35.4	53	0 36.3	53	0 40.7	52	0 44.7	52
56	0 36.6	55	0 37.5	54	0 41.8	53	0 45.7	53
58	0 37.7	55	0 38.6	56	0 42.8	55	0 46.6	54
11 00	0 38.7	57	0 39.5	56	0 43.6	56	0 47.4	55
02	0 39.5	58	0 40.4	58	0 44.4	56	0 48.2	56
04	0 40.3	59	0 41.1	59	0 45.1	58	0 48.8	57
06	0 40.9	60	0 41.8	60	0 45.7	59	0 49.4	58
08	0 41.5	62	0 42.3	61	0 46.2	60	0 49.9	59
11 10	0 42.0	63	0 42.8	62	0 46.6	60	0 50.3	60
12	0 42.3	63	0 43.1	64	0 47.0	61	0 50.6	61
14	0 42.6	65	0 43.4	64	0 47.2	62	0 50.9	61
16	0 42.8	66	0 43.6	65	0 47.4	63	0 51.0	61
18	0 43.0	67	0 43.7	66	0 47.5	64	0 51.1	62
11 20	0 43.0	67	0 43.8	67	0 47.6	65	0 51.2	63
22	0 42.9	68	0 43.7	68	0 47.5	65	0 51.1	64
24	0 42.8	69	0 43.6	68	0 47.4	66	0 51.0	64
26	0 42.5	70	0 43.3	69	0 47.2	66	0 50.8	65
28	0 42.2	70	0 43.0	69	0 46.9	67	0 50.6	66
11 30	0 41.8	71	0 42.6	70	0 46.5	67	0 50.2	66
32	0 41.3	71	0 42.1	70	0 46.1	68	0 49.8	66
34	0 40.7	71	0 41.5	70	0 45.5	68	0 49.3	66
36	0 40.0	71	0 40.8	70	0 44.9	68	0 48.7	66
38	0 39.2	71	0 40.0	70	0 44.2	68	0 48.0	66
11 40	0 38.2	70	0 39.1	69	0 43.4	68	0 47.3	66
42	0 37.1	69	0 38.1	68	0 42.4	67	0 46.4	66
44	0 35.9	67	0 36.9	68	0 41.4	66	0 45.5	66
46	0 34.5	66	0 35.5	66	0 40.2	65	0 44.4	66
48	0 32.9	63	0 34.0	64	0 38.9	65	0 43.2	65
11 50	0 31.0	60	0 32.2	61				

LOCAL CIRCUMSTANCES FOR POINTS ON CENTRAL LINE

Universal Time	Central Line		First Contact			Second Contact		
	Latitude	Longitude	Universal Time	P	V	Universal Time	P	V
	h m ° '	h m ° '	h m s ° °			h m s ° °		
10 44	+79 25.9	- 99 55.1	9 44 09.2	300	290	10 43 50.5	120	109
45	78 09.8	84 47.9	9 43 46.8	301	291	10 44 48.5	120	109
46	76 59.7	78 20.9	9 43 59.8	301	291	10 45 47.5	121	109
10 47	+75 54.8	- 74 20.0	9 44 22.7	301	292	10 46 46.6	121	109
48	74 54.4	71 33.0	9 44 51.4	302	292	10 47 45.9	121	109
49	73 57.5	69 30.4	9 45 23.6	302	292	10 48 45.2	121	108
10 50	+73 03.7	- 67 57.2	9 45 58.7	302	292	10 49 44.7	122	108
52	71 23.3	65 47.0	9 47 14.8	303	292	10 51 43.7	122	107
54	69 50.9	64 23.6	9 48 37.0	303	291	10 53 42.9	122	107
56	68 24.6	63 29.2	9 50 03.9	303	291	10 55 42.2	123	106
58	67 03.4	62 54.0	9 51 34.5	304	291	10 57 41.5	123	105
11 00	+65 46.5	- 62 32.3	9 53 08.3	304	290	10 59 41.0	123	104
02	64 33.1	62 20.7	9 54 45.0	304	289	11 01 40.5	123	103
04	63 22.8	62 16.8	9 56 24.3	304	289	11 03 40.1	123	102
06	62 15.2	62 19.0	9 58 06.0	304	288	11 05 39.7	124	101
08	61 10.0	62 26.2	9 59 49.9	305	287	11 07 39.4	124	100
11 10	+60 07.0	- 62 37.6	10 01 36.1	305	286	11 09 39.2	124	99
12	59 05.8	62 52.7	10 03 24.2	305	286	11 11 38.9	124	98
14	58 06.4	63 11.2	10 05 14.3	305	285	11 13 38.8	124	97
16	57 08.6	63 32.6	10 07 06.5	305	283	11 15 38.7	124	96
18	56 12.2	63 56.9	10 09 00.7	305	282	11 17 38.6	124	95
11 20	+55 17.1	- 64 24.0	10 10 56.9	305	281	11 19 38.6	124	94
22	54 23.2	64 53.8	10 12 55.0	305	280	11 21 38.6	124	93
24	53 30.5	65 26.4	10 14 55.2	305	279	11 23 38.8	124	92
26	52 38.8	66 01.9	10 16 57.5	305	278	11 25 38.9	124	90
28	51 48.1	66 40.5	10 19 02.0	305	276	11 27 39.1	124	89
11 30	+50 58.2	- 67 22.3	10 21 08.8	305	275	11 29 39.3	124	88
32	50 09.3	68 07.7	10 23 18.0	305	274	11 31 39.5	124	87
34	49 21.1	68 57.1	10 25 29.8	305	272	11 33 39.9	123	85
36	48 33.6	69 51.2	10 27 44.3	305	271	11 35 40.3	123	84
38	47 46.9	70 50.5	10 30 02.0	304	269	11 37 40.8	123	83
11 40	+47 00.8	- 71 56.3	10 32 23.2	304	268	11 39 41.3	123	82
42	46 15.3	73 09.9	10 34 48.3	304	266	11 41 42.0	123	80
44	45 30.4	74 33.7	10 37 18.3	304	264	11 43 42.7	122	79
46	44 46.0	76 11.3	10 39 54.4	303	263	11 45 43.6	122	77
48	44 02.1	78 09.3	10 42 39.1	303	261	11 47 44.6	121	76
11 49	+43 40.3	- 79 19.8	10 44 05.9	303	260	11 48 45.2	121	75
50	43 18.5	80 42.3	10 45 37.3	302	259	11 49 46.0	121	74
51	42 56.9	82 23.7	10 47 15.6	302	257	11 50 46.9	121	74
52	+42 35.2	- 84 43.2	10 49 07.4	302	256	11 51 48.0	120	73

TOTAL SOLAR ECLIPSE OF 22 SEPTEMBER 1968

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LOCAL CIRCUMSTANCES FOR POINTS ON CENTRAL LINE

Maximum Eclipse					Third Contact					Fourth Contact					Dura- tion	Width of Path	
Universal Time		Magni- tude	Sun's Alt. Az.		Universal Time		P	V	Universal Time		P	V					
h	m	s	°	'	h	m	s	°	'	h	m	s	°	'			
10	44	00.0	1.005	2	263	10	44	09.5	299	289	..	..	..	..	0 19.0	36	
10	45	00.0	1.006	5	248	10	45	11.5	300	289	11	44	58.1	120	108	0 23.0	40
10	46	00.0	1.007	6	242	10	46	12.5	301	289	11	46	39.5	120	107	0 25.0	44
10	47	00.0	1.007	8	239	10	47	13.4	301	289	11	48	11.2	121	107	0 26.8	45
10	48	00.0	1.008	9	236	10	48	14.1	301	289	11	49	37.4	121	106	0 28.2	47
10	49	00.0	1.008	10	235	10	49	14.8	301	288	11	51	00.1	121	106	0 29.6	48
10	50	00.0	1.008	10	234	10	50	15.3	302	288	11	52	20.0	121	105	0 30.6	49
10	52	00.0	1.009	12	232	10	52	16.3	302	287	11	54	53.9	121	104	0 32.6	52
10	54	00.0	1.009	13	232	10	54	17.1	302	287	11	57	22.0	122	103	0 34.2	53
10	56	00.0	1.009	14	231	10	56	17.8	303	286	11	59	45.4	122	102	0 35.6	55
10	58	00.0	1.009	15	232	10	58	18.5	303	285	12	02	05.0	122	101	0 37.0	57
11	00	00.0	1.010	16	232	11	00	19.0	303	284	12	04	21.5	122	100	0 38.0	58
11	02	00.0	1.010	16	233	11	02	19.5	303	283	12	06	35.2	122	99	0 39.0	59
11	04	00.0	1.010	17	233	11	04	19.9	303	282	12	08	46.4	123	98	0 39.8	61
11	06	00.0	1.010	17	234	11	06	20.3	304	281	12	10	55.4	123	97	0 40.6	63
11	08	00.0	1.010	18	235	11	08	20.6	304	280	12	13	02.2	123	96	0 41.2	63
11	10	00.0	1.010	18	236	11	10	20.8	304	279	12	15	07.0	123	94	0 41.6	65
11	12	00.0	1.011	18	237	11	12	21.1	304	278	12	17	09.8	123	93	0 42.2	66
11	14	00.0	1.011	19	238	11	14	21.2	304	277	12	19	10.9	123	92	0 42.4	67
11	16	00.0	1.011	19	239	11	16	21.3	304	276	12	21	10.1	123	91	0 42.6	68
11	18	00.0	1.011	19	240	11	18	21.4	304	275	12	23	07.6	123	90	0 42.8	69
11	20	00.0	1.011	19	241	11	20	21.4	304	274	12	25	03.4	123	89	0 42.8	71
11	22	00.0	1.011	19	242	11	22	21.4	304	273	12	26	57.5	123	88	0 42.8	71
11	24	00.0	1.011	18	244	11	24	21.2	304	271	12	28	49.8	123	87	0 42.4	72
11	26	00.0	1.011	18	245	11	26	21.1	304	270	12	30	40.4	123	86	0 42.2	73
11	28	00.0	1.011	18	246	11	28	20.9	304	269	12	32	29.2	122	85	0 41.8	73
11	30	00.0	1.010	18	247	11	30	20.7	304	268	12	34	16.3	122	84	0 41.4	74
11	32	00.0	1.010	17	249	11	32	20.5	304	267	12	36	01.3	122	83	0 41.0	74
11	34	00.0	1.010	17	250	11	34	20.1	303	265	12	37	44.3	122	82	0 40.2	74
11	36	00.0	1.010	16	251	11	36	19.7	303	264	12	39	25.1	122	81	0 39.4	74
11	38	00.0	1.010	15	253	11	38	19.2	303	263	12	41	03.5	122	79	0 38.4	73
11	40	00.0	1.010	14	254	11	40	18.7	303	262	12	42	39.2	121	78	0 37.4	71
11	42	00.0	1.009	14	256	11	42	18.0	303	260	12	44	11.8	121	77	0 36.0	70
11	44	00.0	1.009	12	257	11	44	17.3	302	259	12	45	40.7	121	76	0 34.6	68
11	46	00.0	1.009	11	259	11	46	16.4	302	257	12	47	04.8	121	75	0 32.8	65
11	48	00.0	1.008	9	261	11	48	15.4	301	256	..	..	..	..	..	0 30.8	61
11	49	00.0	1.008	8	262	11	49	14.8	301	255	..	..	..	..	..	0 29.6	58
11	50	00.0	1.008	7	263	11	50	14.0	301	254	..	..	..	..	..	0 28.0	55
11	51	00.0	1.007	6	265	11	51	13.1	301	254	..	..	..	..	..	0 26.2	52
11	52	00.0	1.007	4	266	11	52	12.0	300	253	..	..	..	..	..	0 24.0	47

LOCAL CIRCUMSTANCES

Geographic Locations	Latitude		Longitude		First Contact			Second Contact					
					Universal	P	V	Universal	P	V			
	°	'	°	'	h	m	s	°	'	°	'	°	'
Austria													
Graz	+47	04.6	- 15	26.9	9	42	39.7	348		3			
Innsbruck	+47	16.1	- 11	22.9	9	40	42.9	352		11			
Kremsmünster	+48	03.4	- 14	07.9	9	40	10.9	348		4			
Vienna	+48	13.9	- 16	20.3	9	40	53.8	345		0			
Belgium													
Bruxelles	+50	50.0	- 4	21.0	9	31	30.5	352		14			
Liège	+50	37.1	- 5	33.9	9	32	15.2	351		13			
Uccle	+50	47.9	- 4	21.5	9	31	34.4	352		15			
Czechoslovakia													
Brno	+49	12.3	- 16	35.3	9	39	18.7	344		358			
Prague	+50	04.7	- 14	25.2	9	36	43.1	344		0			
Skalnaté Pleso	+49	11.3	- 20	14.7	9	41	26.0	340		351			
Denmark													
Aarhus	+56	07.7	- 10	11.8	9	26	19.0	339		355			
Brorfelde	+55	37.3	- 11	39.9	9	27	37.8	338		354			
Copenhagen	+55	41.2	- 12	34.7	9	28	03.1	338		353			
England													
Cambridge	+52	12.9	- 0	05.7	9	27	52.3	352		17			
Herstmonceux	+50	52.3	- 0	20.3	9	30	32.2	355		20			
Liverpool	+53	25.0	+ 2	55.0	9	25	03.3	352		18			
London	+51	36.8	+ 0	14.4	9	28	56.2	354		19			
Finland													
Helsinki	+60	09.7	- 24	57.3	9	31	50.3	325		331			
Turku	+60	27.1	- 22	13.8	9	29	45.6	326		333			
France													
Besançon	+47	15.0	- 5	59.4	9	39	33.1	357		20			
Lyons	+45	41.7	- 4	47.1	9	43	36.7	2		26			
Meudon	+48	48.3	- 2	13.9	9	35	23.6	358		23			
Paris	+48	50.2	- 2	20.2	9	35	20.0	357		23			
Strasbourg	+48	35.0	- 7	46.1	9	36	54.2	353		14			
Germany													
Berlin	+52	28.5	- 13	25.5	9	32	31.8	342		357			
Bonn	+50	43.8	- 7	05.8	9	32	32.2	349		11			
Hamburg	+53	28.8	- 10	14.4	9	29	32.5	342		0			
Hanover	+52	23.2	- 9	42.8	9	30	51.3	345		3			
Heidelberg	+49	23.9	- 8	43.3	9	35	32.6	350		11			
Jena	+50	58.9	- 11	42.8	9	33	56.5	345		3			
Leipzig	+51	20.1	- 12	23.5	9	33	42.2	344		1			
Potsdam	+52	22.9	- 13	04.0	9	32	28.4	342		358			
Greece													
Athens	+37	58.3	- 23	43.0	10	07	22.1	352		355			
Thessaloniki	+40	38.0	- 22	58.0	10	00	19.1	349		355			
Hungary													
Budapest	+47	30.0	- 18	57.9	9	43	37.4	344		356			
Kalocsa	+46	31.7	- 18	58.5	9	45	27.8	345		357			
Szombathely	+47	13.9	- 16	37.4	9	42	54.5	346		1			
Ireland													
Armagh	+54	21.2	+ 6	38.9	9	22	41.2	353		19			
Dublin	+53	23.2	+ 6	20.3	9	24	27.9	355		22			
Italy													
Castel Gandolfo	+41	44.8	- 12	39.1	9	54	45.8	0		18			
Florence	+43	45.2	- 11	15.3	9	49	05.4	358		17			
Genoa	+44	25.2	- 8	55.3	9	47	07.8	359		21			
Rome	+41	55.3	- 12	27.1	9	54	15.5	0		18			
Lebanon													
Beirut	+33	54.4	- 35	28.2	10	24	43.5	342		323			
Tripoli	+34	27.0	- 35	50.0	10	23	38.3	341		322			
Netherlands													
Amsterdam	+52	22.3	- 4	54.7	9	28	59.2	348		10			
Groningen	+53	13.2	- 6	33.8	9	28	17.6	346		6			
Leiden	+52	09.3	- 4	29.0	9	29	12.1	349		11			
Utrecht	+52	05.2	- 5	07.8	9	29	31.8	349		10			

LOCAL CIRCUMSTANCES

Maximum Eclipse			Third Contact			Fourth Contact			Duration	Width of Path
Universal Time	Magnitude	Sun's Alt. Az.	Universal Time	P	V	Universal Time	P	V		
h m s		° °	h m s	°	°	h m s	°	°	m s	mi
10 46 08.8	0.404	43 178				11 49 19.9	94	81		
10 40 29.5	0.349	43 171				11 40 25.6	90	83		
10 43 06.8	0.402	42 176				11 45 56.8	94	83		
10 45 43.9	0.437	42 179				11 50 12.9	96	83		
10 27 38.5	0.324	37 159				11 24 36.8	87	89		
10 29 20.2	0.335	38 160				11 27 10.7	88	89		
10 27 40.8	0.323	38 159				11 24 37.4	87	89		
10 44 45.7	0.456	41 179				11 49 52.7	97	84		
10 40 57.8	0.441	40 175				11 45 09.8	96	86		
10 49 19.1	0.507	41 186				11 56 23.8	101	83		
10 30 09.7	0.493	34 167				11 34 33.3	98	94		
10 32 08.6	0.501	34 170				11 37 03.9	98	93		
10 33 04.6	0.512	34 171				11 38 25.8	99	93		
10 21 28.9	0.302	35 152				11 16 10.5	85	92		
10 22 39.5	0.276	36 152				11 15 47.3	83	90		
10 17 22.8	0.296	32 148				11 10 55.4	84	93		
10 21 27.7	0.285	35 151				11 15 02.9	84	91		
10 41 14.4	0.704	30 188				11 49 54.6	109	96		
10 38 28.1	0.681	30 184				11 46 43.1	108	97		
10 33 14.8	0.272	42 161				11 27 30.8	84	84		
10 33 19.7	0.222	43 159				11 23 35.2	80	83		
10 26 41.6	0.254	39 155				11 18 49.3	82	87		
10 26 48.2	0.256	39 155				11 19 06.1	82	87		
10 34 10.0	0.323	41 164				11 31 57.3	88	86		
10 37 04.7	0.468	38 173				11 41 46.9	97	89		
10 31 08.6	0.356	38 163				11 30 24.6	90	89		
10 32 23.5	0.447	36 168				11 35 43.9	96	91		
10 32 46.4	0.421	37 167				11 35 11.8	94	90		
10 34 31.5	0.352	40 166				11 33 59.6	90	86		
10 36 35.6	0.421	39 171				11 39 31.4	94	88		
10 37 02.8	0.436	39 172				11 40 36.7	95	88		
10 36 45.1	0.462	38 173				11 41 13.0	97	89		
11 12 43.7	0.390	50 202				12 16 04.6	95	62		
11 06 42.4	0.419	48 197				12 11 20.9	96	68		
10 50 07.0	0.463	43 185				11 55 52.6	98	81		
10 51 33.4	0.447	44 185				11 56 51.8	97	79		
10 47 28.4	0.424	43 180				11 51 35.9	96	81		
10 12 58.9	0.279	30 143				11 04 35.7	82	95		
10 13 36.0	0.260	31 143				11 03 59.6	80	94		
10 50 10.1	0.266	48 176				11 45 21.1	85	73		
10 45 05.3	0.281	46 172				11 41 05.6	86	77		
10 40 48.8	0.258	45 167				11 34 43.9	84	79		
10 49 36.1	0.266	48 175				11 44 44.7	85	74		
11 36 07.9	0.526	45 228				12 43 11.3	102	54		
11 35 26.8	0.539	45 227				12 42 52.3	103	55		
10 27 04.7	0.362	36 159				11 26 01.9	90	91		
10 28 21.4	0.398	36 162				11 29 11.6	92	92		
10 26 44.2	0.352	36 159				11 25 09.2	89	91		
10 27 33.8	0.359	36 160				11 26 26.2	90	91		

LOCAL CIRCUMSTANCES (Continued)

Geographic Locations			First Contact				Second Contact					
	Latitude	Longitude	Universal Time			P	V	Universal Time			P	V
	° ' ''	° ' ''	h	m	s	°	°	h	m	s	°	°
Norway												
Bergen	+60 23.0	- 5 20.0	9	20	15.6	335	352					
Harestua	+60 12.5	- 10 45.5	9	23	03.0	333	347					
Oslo	+59 56.0	- 10 45.0	9	23	14.9	333	348					
Poland												
Borowiec	+52 16.6	- 17 04.6	9	34	51.3	339	352					
Toruń	+53 05.8	- 18 33.3	9	34	40.0	337	348					
Warsaw	+52 13.1	- 21 01.8	9	37	27.0	336	346					
Romania												
Bucharest	+44 24.8	- 26 05.8	9	53	57.7	341	344					
Ploesti	+44 57.0	- 26 01.0	9	52	51.8	340	344					
R.S.F.S.R.												
Chelyabinsk	+55 12.0	- 61 25.0	10	08	34.9	307	285					
Gorki	+56 15.5	- 43 59.0	9	51	19.3	316	307					
Irbit	+57 44.0	- 63 02.0	10	05	43.7	305	284	11	14	16.2	142	115
Kaliningrad	+54 42.8	- 20 29.7	9	33	57.8	333	343					
Kamyshlov	+56 55.0	- 62 41.0	10	06	47.3	305	284					
Kazan	+55 47.4	- 49 07.3	9	56	38.5	313	300					
Kurgan	+55 30.0	- 65 20.0	10	11	20.2	305	281					
Kurtamysk	+54 55.0	- 64 22.0	10	11	33.4	305	281	11	20	20.3	138	108
Leningrad	+59 56.5	- 30 17.7	9	35	53.6	322	324					
Moscow	+55 45.3	- 37 34.2	9	46	14.0	321	317					
Pulkovo	+59 46.3	- 30 19.6	9	36	04.0	322	324					
Shadrinsk	+56 08.0	- 63 32.0	10	08	47.5	305	283	11	17	34.9	153	124
Simeis, Crimea	+44 24.2	- 33 59.8	10	00	18.4	333	327					
Sos'va	+59 10.0	- 61 50.0	10	02	28.9	305	287					
Sverdlovsk	+56 52.0	- 60 35.0	10	05	08.0	307	286					
Tomsk	+56 28.1	- 84 56.8	10	22	19.0	297	267					
Turinsk	+58 03.0	- 63 42.0	10	05	44.2	305	284	11	14	05.8	92	65
Tyumen	+57 11.0	- 65 29.0	10	08	34.4	304	282					
Vorkuta	+67 27.0	- 64 00.0	9	51	40.4	303	290	10	57	41.3	59	42
S.S.R.												
Abastuman, Georgian	+41 45.3	- 42 49.5	10	13	56.2	327	308					
Alma-Ata, Kazak	+43 11.3	- 76 57.4	10	43	32.5	304	261					
Ashkhabad, Turkmen	+37 57.4	- 58 21.2	10	38	06.4	317	277					
Burakan, Armenian	+40 20.1	- 44 17.5	10	18	19.6	327	304					
Dushanbe, Tadjik	+38 33.7	- 68 46.9	10	46	38.3	310	265					
Kharkov, Ukrainian	+50 00.2	- 36 13.9	9	52	53.4	326	321					
Kitab, Uzbek	+39 08.0	- 66 52.9	10	43	50.0	311	267					
Myn-Aral, Kazak	+45 24.0	- 73 40.0	10	36	51.3	304	265	11	43	44.4	186	143
Tashkent, Uzbek	+41 19.5	- 69 17.6	10	41	28.3	308	266					
Scotland												
Edinburgh	+55 55.5	+ 3 11.0	9	21	11.6	347	11					
Glasgow	+55 53.0	+ 4 15.0	9	20	56.9	348	13					
Sweden												
Lund	+55 41.9	- 13 11.2	9	28	22.4	337	352					
Stockholm	+59 16.3	- 18 18.5	9	28	07.1	329	340					
Uppsala	+59 51.5	- 17 37.5	9	27	14.7	329	340					
Switzerland												
Berne	+46 57.2	- 7 25.7	9	40	28.0	356	18					
Geneva	+46 12.0	- 6 09.2	9	42	13.2	359	22					
Neuchâtel	+46 59.8	- 6 57.4	9	40	17.5	357	19					
Zürich	+47 22.6	- 8 33.1	9	39	42.4	354	15					
Turkey												
Ankara	+39 55.0	- 32 50.0	10	08	23.7	339	331					
Istanbul	+41 00.8	- 28 58.0	10	03	03.3	342	340					
Yugoslavia												
Belgrade	+44 48.2	- 20 30.8	9	49	43.8	346	356					
Blaca	+43 17.5	- 16 32.0	9	51	22.5	353	7					
Zagreb	+45 49.5	- 16 01.3	9	45	28.4	349	4					

TOTAL SOLAR ECLIPSE OF 22 SEPTEMBER 1968

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LOCAL CIRCUMSTANCES (Continued)

Maximum Eclipse			Sun's		Third Contact			Fourth Contact			Dura-		Width	
Universal	Magni-	Alt.	Az.		Universal	P	V	Universal	P	V	tion		of	
Time	tude		°	°	Time	°	°	Time	°	°	m	s	Path	mi
h m s					h m s			h m s						
10 22 53.4	0.519	28	160					11 26 26.3	98	99				
10 28 00.0	0.567	30	168					11 33 29.0	101	98				
10 28 09.6	0.562	30	168					11 33 36.4	101	98				
10 41 35.0	0.511	38	179					11 48 03.4	100	88				
10 42 20.4	0.542	37	181					11 49 37.4	102	89				
10 46 14.4	0.561	38	186					11 54 17.8	103	87				
11 04 08.1	0.523	44	200					12 12 18.1	102	74				
11 03 07.1	0.529	44	199					12 11 25.4	102	75				
11 18 23.9	0.987	20	238					12 24 15.3	122	89				
11 03 34.1	0.856	28	217					12 12 54.8	117	90				
11 14 36.5	1.011	19	238		11 14 56.9	286	259	12 19 51.5	123	92	0 40.7		67	
10 42 38.7	0.589	36	184					11 50 47.3	104	90				
11 15 55.9	0.999	19	238					12 21 20.2	123	91				
11 08 35.8	0.898	27	224					12 17 12.5	119	90				
11 20 06.5	0.999	18	242					12 24 54.2	123	89				
11 20 41.1	1.011	19	242		11 21 01.9	290	259	12 25 46.0	123	89	0 41.6		71	
10 46 18.1	0.753	29	196					11 55 27.0	112	95				
10 58 37.3	0.790	31	208					12 08 37.4	114	90				
10 46 31.7	0.752	30	196					11 55 43.1	112	95				
11 17 53.7	1.011	19	240		11 18 12.5	275	246	12 23 08.2	123	90	0 37.6		69	
11 13 46.9	0.637	41	213					12 24 00.8	108	73				
11 11 17.1	0.999	19	236					12 16 41.2	123	94				
11 14 46.1	0.987	20	236					12 20 42.4	122	91				
11 25 34.6	0.923	7	260					...	...	...				
11 14 23.6	1.011	18	239		11 14 41.4	336	309	12 19 27.1	123	92	0 35.6		67	
11 16 59.3	0.994	18	241					12 21 39.5	123	91				
10 57 49.4	1.009	14	233		10 57 57.5	6	348	12 01 39.5	122	101	0 16.2		56	
11 28 38.2	0.724	37	228					12 38 37.1	112	69				
11 49 17.0	0.993	10	261					...	...	...				
11 50 06.9	0.843	25	249					12 56 04.9	115	64				
11 32 58.0	0.727	36	232					12 42 34.4	111	67				
11 55 05.0	0.916	16	257					12 57 43.9	117	65				
11 06 27.6	0.725	36	211					12 17 07.0	112	82				
11 53 02.9	0.913	18	255					12 56 26.4	117	66				
11 43 52.2	1.009	13	257		11 44 00.0	238	195	12 45 49.5	121	76	0 15.6		68	
11 49 57.5	0.947	16	256					12 52 52.3	118	70				
10 16 08.6	0.349	30	148					11 12 24.7	87	96				
10 15 03.8	0.338	30	146					11 10 31.4	86	96				
10 33 43.4	0.519	34	172					11 39 20.7	100	93				
10 35 51.1	0.627	31	179					11 43 27.1	105	96				
10 34 42.5	0.628	30	178					11 42 07.3	105	97				
10 35 32.1	0.286	42	164					11 31 04.4	86	84				
10 34 39.5	0.252	43	162					11 27 36.3	83	83				
10 34 50.6	0.280	42	163					11 29 53.9	85	84				
10 36 33.8	0.310	42	166					11 33 49.9	87	84				
11 20 50.3	0.565	44	216					12 29 47.2	104	65				
11 13 54.6	0.520	46	208					12 22 00.8	102	68				
10 56 14.8	0.444	45	189					12 01 39.2	97	76				
10 53 15.5	0.357	47	182					11 54 31.1	92	75				
10 48 41.3	0.392	44	180					11 51 28.3	94	79				